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EXAMINER	
SONG, MATTHEW J	
ART UNIT	PAPER NUMBER
1765	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/047,323	Applicant(s) LAMPERT ET AL.
	Examiner Matthew J Song	Art Unit 1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 April 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1, 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fissel et al (Low temperature growth of SiC thin films on Si and 6H-SiC by solid source molecular beam epitaxy) in view of Tashiro (JP 62-091492), an English Abstract has been provided, Hamza et al (US 5,861,346) and Pickar (US 3,385,723).

Fissel et al discloses a method of SiC growth on 6H-SiC by solid source molecular beam epitaxy (MBE). Fissel et al also discloses source materials of high purity polycrystalline silicon, this reads on applicant's solid Si, and of high purity of pyrolitic carbon were coevaporated separately, by means of electron beam guns (pg 3182, col 1). Fissel et also discloses SiC

substrates prepared from Acheson grown crystals, this reads on providing a substrate, were scrubbed with liquid detergent, HF-dipped, cleaned in hot HCl and heated to 600°C for 30 min in a separated preparation chamber, this reads on preparing said substrate, before loading into the deposition chamber (pg 3182, col 2). Fissel et al also discloses the chamber pressure was held at $5x10^{-7}$-$8x10^{-8}$ Pa, this reads on evacuating the growth chamber, and growing epitaxial SiC films at temperatures between 800-1000°C, this reads on applicant's heating the substrate.

Fissel et al does not teach an MBE system having effusion cells having shutters and charging crucibles with materials, installing the crucibles into effusion cells a placing the effusion cells into the growth chamber.

In a molecular beam epitaxy device, Tashiro teaches a cell shutter is in front of the surface of plural cells each having a crucible charged with a raw material and growing a crystal. Tashiro also teaches a crucible **1** charged with a raw material **2** in a cell **8** and opening and closing the shutters **3** to form an epitaxial crystal (Abstract). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Fissel et al with Tashiro MBE device with shutters to control the flux of raw materials in an effusion cell.

The combination of Fissel et al and Tashiro does not teach charging a first crucible with a quantity of Fullerenes.

In a method of forming SiC films, note entire reference, Hamza et al teaches growing crystalline thin films of silicon carbide on silicon substrate via reaction of silicon with C_{60}, this reads on applicant's fullerenes (col 2, ln 20-45). Hamza et al also teaches a molecular beam scattering apparatus consists of three vacuum chambers and a source chamber houses a C_{60} Knudsen source and a mechanical chopper, this reads on applicant's shutter (col 3, ln 1-45).

Hamza et al also teaches the C_{60} may be in solid form and to achieve thicker films silicon may be vaporized along with C_{60} to deposit SiC on a silicon substrate (col 3, ln 45-67). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Fissel et al and Tashiro with Hamza et al's C_{60} source of carbon because SiC can be formed at low temperatures in a hydrogen-free environment (col 1, ln 15-65).

The combination of Fissel et al, Tashiro and Hamza et al does not teach coating a crucible with a layer of SiC.

In a method of reducing impurities in a Silicon melt, Pickar teaches a method of producing carbon articles having a protective coating against highly reactive gases or liquids at high temperatures. Pickar also teaches a pure graphitic crucible having a coating of polycrystalline beta silicon carbide in which molten silicon or other highly reactive liquids can be maintained for many hours at high temperatures without causing introduction of impurities into the melt (col 1, ln 20-72). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Fissel et al, Tashiro and Hamza et al with Pickar to prevent introducing impurities into a silicon raw material.

Referring to claims 3-4, the combination of Fissel et al, Tashiro, Hamza et al and Pickar does not teach the temperature claimed. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Fissel et al, Tashiro, Hamza et al and Pickar by optimizing the temperature by conducting routine experimentation of result effective variable. Also, the selection of reaction parameters such as temperature and concentration is obvious (In re Aller 105 USPQ 233, 255 (CCPA 1955)). Furthermore,

Fullerenes are known to sublime at 550°C, note Gruen et al (US 5,620,512) and Silicon is known to sublime at 1600°C, note Shiomi et al (US 6,193,797).

3. Claim 2 rejected under 35 U.S.C. 103(a) as being unpatentable over Fissel et al (Low temperature growth of SiC thin films on Si and 6H-SiC by solid source molecular beam epitaxy) in view of Tashiro (JP 62-091492), an English Abstract has been provided, Hamza et al (US 5,861,346) and Pickar (US 3,385,723) as applied to claims 1 and 3-4 above, and further in view of Kaneda et al (MBE Growth of 3C SiC/ 6H SiC and the Electric Properties of Its p-n Junction).

The combination of Fissel et al, Tashiro, Hamza et al and Pickar teach all of the limitations of claim 2, as discussed previously, except the temperature of the substrate is 1500°C

In a Solid source MBE growth of SiC, Kaneda et al teaches the important parameters of MBE growth are the substrate temperature and molecular beam intensities. Kaneda et al also teaches a substrate temperature of 1100-16000°C (pg 537, Fig 5f and Fig 6c). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Fissel et al, Tashiro, Hamza et al and Pickar with Kaneda et al's substrate temperature to produce an expected result.

4. Claim 5 rejected under 35 U.S.C. 103(a) as being unpatentable over Fissel et al (Low temperature growth of SiC thin films on Si and 6H-SiC by solid source molecular beam epitaxy) in view of Tashiro (JP 62-091492), an English Abstract has been provided, Hamza et al (US

5,861,346) and Pickar (US 3,385,723) as applied to claims 1 ,3 and 4 above, and further in view of Powell et al (US 5,915,194) or Burd (US 3,675,619) .

The combination of Fissel et al, Tashiro, Hamza et al and Pickar teaches all of the limitations of claim 5, as discussed previously, except the substrate is prepared by chemical mechanical polishing.

In a method of preparing SiC substrates for epitaxial growth of SiC, Powell et al teaches a SiC substrate **24** is pretreated to remove contaminants or impurities on the surface to facilitate the growing of high-quality, low defect epitaxial films, where various pregrowth treatments such as oxidation, chemical mechanical polishing or reactive ion etching may be used to remove potential unwanted nucleation sites prior to growth the crystal epilayers (col 11, ln 45-65). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Fissel et al, Tashiro, Hamza et al and Pickar with Powell et al to remove impurities on the surface of the substrate to facilitate the growing of high-quality, low defect epitaxial layers.

In a method of producing epitaxial films, Burd teaches substrates are prepared by an abrasive polishing, this reads on applicant's chemical mechanical polishing, a chemical polishing, rinsed with pure water and dried with a stream of pure nitrogen, this reads on applicant's pressurized N_2 (col 10, ln 50 to col 11, ln 5). Burd also teaches a variety of substrates including the same materials used in epitaxial films, compounds of elements of Group II and VI and compounds of Group I and VII and elements of Si and Ge (col 7, ln 1-35). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the

combination of Fissel et al, Tashiro, Hamza et al and Pickar with Burd's substrate preparation method to reduce surface contaminants and impurities.

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fissel et al (Low temperature growth of SiC thin films on Si and 6H-SiC by solid source molecular beam epitaxy) in view of Tashiro (JP 62-091492), an English Abstract has been provided, Hamza et al (US 5,861,346), and Pickar (US 3,385,723) as applied to claims 1,3 and 4 above, and further in view of Sneed et al (US 5,354,384) and Burd (US 3,675,619).

The combination of Fissel et al, Tashiro, Hamza et al, Pickar and Powell et al teach all of the limitations of claim 6, as discussed previously, except cleaning with pressurized CO_2.

In a method of cleaning a substrate, note entire reference, Sneed et al teaches a jet spray of carbon dioxide, this reads on applicant's pressurized CO_2, is used to remove molecular and particular contaminants from a variety of surfaces including silicon wafers, telescope mirrors and thin film optical coatings (col 1, ln 50-60). Sneed et al also teaches the jet spray may be used to clean any surface or structure requiring high levels of cleanliness or precision cleaning (col 4, ln 15-45). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Fissel et al, Tashiro, Hamza et al, Pickar and Powell et al with Sneed's jet spray of CO_2 to remove molecular and particular contaminants from the surface of a substrate.

The combination of Fissel et al, Tashiro, Hamza et al, Pickar, Powell et al and Sneed do not teach polishing and drying with pressurized N_2.

In a method of producing epitaxial films, Burd teaches substrates are prepared by an abrasive polishing, a chemical polishing, rinsed with pure water and dried with a stream of pure nitrogen, this reads on applicant's pressurized N_2 (col 10, ln 50 to col 11, ln 5). Burd also teaches a variety of substrates including the same materials used in epitaxial films, compounds of elements of Group II and VI and compounds of Group I and VII and elements of Si and Ge (col 7, ln 1-35). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Fissel et al, Tashiro, Hamza et al, Pickar, Powell et al and Sneed et al with Burd's substrate preparation method to reduce surface contaminants and impurities.

Response to Arguments

6. Applicant's arguments filed 4/1/2003 have been fully considered but they are not persuasive.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., a uniform SiC layer and the requisite nonporous coating) (pg 7) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

7. Applicant's arguments with respect to claims 1-6 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kito et al (US 6,110,279) teaches molecular beam epitaxy of SiC using solid Si and solid C sources (col 11, ln 1-25).

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on 703-308-3868. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song
Examiner
Art Unit 1765

MJS
June 13, 2003

BENJAMIN L. UTECH
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